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CONFIDENTIAL15 Nov 1954

TO [REDACTED]

FROM [REDACTED]

SUBJECT: Inspection Under Contract Number RD-91

With [REDACTED]

1. In accordance with your request, the responsibility for performing the inspection duties of the subject contract is assigned to your Division. One of these basic duties involves the monitoring of the contractor's performance at his place of business to ascertain that it meets the quality standards of the contract.

2. In order to assure proper evaluation of this contractor's ability and adequacy of performance, it is requested that a report be forwarded to this division for each inspection performed, either at the contractor's plant or on final acceptance at point of delivery. These reports should include information regarding the number of items accepted and rejected, the reasons for any rejections, and the progress of the work in relation to the contractual provisions for delivery. The report covering final inspection and acceptance, or at such intermediate time as may be appropriate, should include an evaluation of the overall performance of the contractor concerning his technical ability, accomplishments on the work performed, and any other factors which may affect contractual relationships in the future.

3. The inspection responsibility will also include the authentication of the need for and proper use of Government furnished and acquired equipment and supplies, and where required, the checking of Bills of Material against materials claimed to be used by the contractor to assure qualitative and quantitative accuracy for audit and/or final negotiations and settlement of the contract.

4. It is further requested that your office return a copy of this memorandum accepting this responsibility and indicating the following:

Name of your inspector.

Place and scheduled dates (approximate) of inspection.

[REDACTED]
Distribution;

Orig. & 1 - Addressee

1 - Contract Jacket

1 - Inspection Chrono

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CONFIDENTIALH-2061 - RESIDUAL MATERIALRESISTORS

<u>AMOUNT</u>	<u>VALUE</u>	<u>WATTAGE</u>	<u>TOLERANCE</u>
1	220 ohm	1/2W	5%
5	3.3K	1/4W	10%
4	100 ohm	1/2W	5%
1	380 ohm	1/2W	5%
2	6.8K	1/2W	10%
2	27 ohm	1/2W	5%
7	2.2K	1/2W	5%
12	2.7K	1/2W	5%
7	39K	1/2W	10%
6	3.7K	1/2W	10%
10	5.6K	1/2W	10%
10	2.7K	1/2W	10%
1 Box of Assorted Resistors			
39	270 ohm	1/2W	10%
50	15K	1/2W	10%
8	10 ohm	1/2W	10%
15	10 ohm	1/2W	10%
5	1/2K	1/2W	10%
25	3.9K	1/2W	10%
4	5.1K	1/2W	5%
30	12K	1/2W	10%
20	4.7K	1/2W	10%
14	56K	1/2W	10%
51	100K	1/2W	10%
7	22 meg	1/2W	10%
5	22K	1/2W	10%
3	22 ohm	1/2W	10%
5	470K	1/2W	10%
16	120K	1/2W	10%
11	82K	1/2W	10%
2	330 ohm	1/2W	10%
2	150K	1/2W	10%
2	8.2 meg	1/2W	10%
4	680K	1/2W	10%
10	3.9K	1/2W	5%
2	3.3K	1/2W	10%
2	18K	1/2W	10%
40	4.7K	1/2W	10%
5	120 ohm	1/2W	10%
14	18 ohm	1/2W	10%
65	220 ohm	1/2W	10%
21	680 ohm	1/2W	10%
31	68 ohm	1/2W	10%
210	68K	1/2W	10%
151	470 K	1/2W	10%
30	39K	1/2W	10%
17	330 ohm	1/2W	10%
108	82 ohm	1/2W	10%
37	2 ohm	1/3W	5%
60	1.1 ohm	1/3W	5%
23	2 ohm	1/2W	5%
20	1 ohm	1/2W	5%
85	100K	1/2W	10%
120	10K	1/2W	10%

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CONFIDENTIALH-2061 - RESIDUAL MATERIALRESISTORS

<u>AMOUNT</u>	<u>VALUE</u>	<u>WATTAGE</u>	<u>TOLERANCE</u>
134	4.7K	1/2W	10%
34	22K	1/2W	10%
143	47 ohm	1/2W	10%
102	100 ohm	1/2W	10%
161	150 ohm	1/2W	10%
207	470 ohm	1/2W	10%
142	820 ohm	1/2W	10%
5	1K	2W	10%
136	1.5K	1/2W	10%
255	2.2K	1/2W	10%
37	27K	1/2W	10%
54	1K	1/2W	10%
36	33K	1/2W	10%
35	1 meg	1/2W	10%
45	2.2 meg	1/2W	10%
128	3.3 meg	1/2W	10%

RELAYSAMOUNTPART NUMBERS

5	NORTH ELECTRIC 226BCC 104A
1	452-1536-1
1	452-1581- P122
1	452-1540 P22
1	MT 2222
1	22310-1 - 31955-1
7	226BCC104A

R. F. FILTERSAMOUNTPART NUMBERS

3	170-400MC BX-17401
2	Misc.
2	Misc.
3	1000-2200MC BB-10222
3	50-170MC BX-50171
2	400-1000MC BB-40102

TRANSISTORSAMOUNTPART NUMBER

6	2N68
61	L-5113
6	953T1
2	L-5108
6	L-5021
3	H I
106	2N44
1	T21A-5

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H-2061 - RESIDUAL MATERIAL

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FUSESAMOUNTPART NUMBER

5	8AG 1/100 A
15	3AG 1/100 A SB
12	3AG 15A SB
12	3AG 3A SB
9	3AG 1A SB
12	3AG 5A SB
9	10 amp 250V
5	0.25 amp 250V
10	1 amp 250V
4	20 amp 250V
4	3 amp 250V
3	2 amp 250V
2	5 amp 250V
1	Little fuse holder

COILSAMOUNTPART NUMBER

277	217-5081 (Coil Forms)
1	8300
25	10203-36
5	10100-32
5	10100-30

TUBESAMOUNTDESCRIPTION & PART NUMBER

6	1EP1
2	CK6542
4	CG16
7	DP1
8	1DP7

TRANSFORMERSAMOUNTPART NUMBER

1	UTC V1082
1	PGI 166
52	PGI 154

DIODESAMOUNTPART NUMBER

4	026 10B1D
3	GE 1N93 630
19	1N55A
1	1N21
14	1N263
4	1N354
144	1N38A

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H-2061 - RESIDUAL MATERIALSWITCHESAMOUNTDESCRIPTION & PART NUMBERS

2	Wafer F6X
1	776-1K6 On-off-one throw-4 pole
3	76895-F5X 249, 5 layer wafer switch
1	75484-F2X 2 layer wafer switch
1	DPST
1	SP4T RF
2	ST-22-K
1	75484-9 position

CAPACITORSAMOUNTPART NUMBERS, TYPE & VALUE

151	20 mfd, 10V, 104D3
68	CM15C361J
4	CM45B471K
83	CM20C102J
13	10 mfd, 25V, 104D5
4	2X01, 600V, CP53B4EF104K
49	CM15C71J, 270 mfd
91	.5 mfd, 16V 103D
9	.47 mfd, 100V, 91P4749154
400	2 mmfd, 10% CC20SL020K
1	4 mfd, 250 V
5	360 mmfd, 100V
3	H1-Q .1 mfd
1	.047 mfd, 200V
24	270 mmfd, 200V
5	1000 mmfd, 200V
4	1 mfd, 4V
13	.05 mfd
6	Assorted
7	5 mf, 6V
3	0.01 mf
16	0.1 mf
2	270 mmf, 200V
2	1000 mmf, 200V
2	360 mmf, 200V
2	0.22 mf, 200V
2	0.47 mf, 200V
4	0.10 mf, 600V
2	0.1047 mf, 600V
2	3300 mmf, 600V
1	0.015 mf, 200V
1	Bag Assorted

H-2061 - RESIDUAL MATERIALPOTENTIOMETERSAMOUNTDESCRIPTION

55	DF1159
50	50K
2	5K
8	GW1014-60
58	GW1243-101
1	CTS621
10	1 meg CTS 624
9	2142-V 250ohm
2	50K CTS 643
1	5000 ohm 1W 20%
10	X-3541 1 meg 1/2W
3	DL11989 500K 1W
5	DF11217 100 ohm 2W
1	SX1800 1K CTS 250
5	DF11289 5K 1/2W
24	CTS 643 10K
37	Dual 1 meg CTS 623
1	100K
1	100 ohm
1	40K
1	2710-U 50K

CONNECTORSAMOUNTDESCRIPTION

1	AN3057-12
1	AN31024-16S-1P
1	AN3106-16S-1S
22	IPC Miniature Coax. Male
13	Miniature Coax, Female
1	AN3106A-28-21S
1	AN3102A-16S-1S
1	Type 46000
4	M9S, 756-10753-16
58	45025 (IPC)
24	7075-UG-1094/U
1	AN3106A-16S-1P
1	AN3106A-32-7P
18	UG491A/U
198	(IPC) 46025
1	AN3106A-18-1S
1	AN3057-20
1	AN3106A-32-7P
2	AN3106-28
13	AN165-13
7	AN26-190-24
14	AN26-159-24
18	3370
5	AN165-16
2	AN3106A-28-15S
2	AN3106A-28-21P
1	AN3100C-28-12P
2	AN3102A-22-23S
1	AN3102A-16S-1P
1	AN3102A-16S

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H-2061 - RESIDUAL MATERIALMISCELLANEOUSAMOUNTDESCRIPTION & PART NUMBERS

10	268-10070
10	268-10070-1
9	Receptacle Bracket
10	Tube Socket Bracket
3	Test Point Bracket
1 box	Assorted Brackets
33	MS29513-12Y "O" Rings
41	Gaskets for Plug-in unit
51	Receptacle M-43-H10LR
2	Roller Smith Meters
60	Plug LSH-10 (M4P)
9	268-10062 (Magnetic Shield)
20	Rectifier Junction 1N93
23	Terminals Type 756
2	Rectifiers 368-7414
2	Dial Light 111-3830-122
14	Handles X-1989-X1884
40	Control Knobs
54	Crystals, Back Resistance 1.5 meg (1N55A)
34	Crystals, Back Resistance 1.5 meg to 2 meg (1N55A)
1 bag	Switches C12B-480
1 box	Assorted Cables and Connectors
1	Waveguide
1	Antenna AT-49A/APR-4
67	C.A. Plugs EC-10
42	Boards partially assembled
1	Test Board
1	Dummy Unit
60	Ampli boards partially assembled
18	Boards partially assembled
25	Boards partially assembled
9	Boards partially assembled
9	Boards partially assembled
12	Boards partially assembled
3	Boards partially assembled
35	Transformers PGI-154 V1082
1 box	Assorted Tube Sockets
1 box	Assorted Brackets
20	Waveguide Section Type CR25N (on bracket)
5	Waveguide
4	G.E. Miniature Lamps
6	Assorted Capacitors
9	Cut face plates
	Cases of assorted Amplifier parts
1	Choke
4	Diodes 026 10B1-D
15	Miscellaneous Boards
3	Resistor Meter 5510 ohm
2	Resistor Meter 1345 ohm
2	Resistor Meter 8300 ohm
1	Resistor Meter 34660 ohm

H-2061 - RESIDUAL MATERIALMISCELLANEOUSAMOUNTDESCRIPTION

1 box	Chassis (Misc.)
12	Wire Spaghetti (Misc.)
6	Assorted Spacers
50	368-10073 Spacer Plates
23	Sockets 9799-3-2
10	Socket Pin #9
10	Case & Covers (Plug-in Unit)
5	Panel Front 268-10064
5	Plug, M9P 756-10753-12
5	Sockets 11 Pin, 4118BU
19	Plain Knobs
2	Pointed Knobs
1	Assorted Knobs
6	Clamps, AN3057-16
6	Clamp, AN3057-20
98	Rubber Washers 169805
25	Metal Washers 16-1382
19	Tip Jacks #225
1	Handles Plug-in Unit 268-10060
1	Phone Jacks
3	Receptacle LS/H19C
23	Rectifier 368-7414
	Spare board CRT
	Assorted Boards from H-2061
	<div style="border: 1px solid black; height: 15px; width: 100px;"></div>
2	D.C. Aircraft Motor EW-67
1	Oscilloscope Tektronix type 514AD
	Radar Pulse Analyzer Model RD J-1

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SUBJECT: ELINT Maritime Receiving System - Prototype Design

Background

Field installations and activities have indicated various potential capabilities for mounting ELINT collection operations through the use of small maritime craft. Various considerations have been received from these parties regarding frequency coverage to be provided, as well as specific equipments which the field has considered applicable to the problem.

Objective

To produce an ELINT receiving system based on knowledge of current design and performance characteristics which can be installed on small maritime craft of the PT-boat general class. This system to be sufficiently flexible to permit operational employment by all areas within the range of the area's ability to man the units furnished.

The system will provide crystal video alert and collection capability on a semi-unattended basis; to be so arranged as to permit utilization of video pulse analyzers as more skilled operators are established and to include superhetrodyne equipment where qualified ELINT operators are provided.

The system will permit the field to develop operational evaluation on the following factors: (1) quadrant sensing versus port/starboard or omni-directional; (2) desired video bandwidth for service bands established herein; (3) advantages, from the field standpoint, of maximum collection versus highly discrete limited frequency coverage.

To establish the system in a manner that "cluster" type radar installations at known locations can be established as operating on a simultaneous basis on the same or on individual frequency (band) basis.

Proposal

It is proposed that the following system be established, at this time, to provide for a Crystal Video Alert/Collection unit and a Manned Two-position Superhetrodyne Collection Unit, as follows:

- a. Crystal video alert and collection system from 50 mcs through 40 kmc with quadrant sensing and alert indicating ability.
- b. Superhetrodyne coverage from 40 mcs to 6000 mcs through utilization of service equipment and necessary antennas.
- c. Provide pulse analyzer units for use with the superhetrodyne receivers and upon demand may be employed with the crystal video units.
- d. Provide panoramic adapters as an operating aid to the superhetrodyne receiver operators.

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Specific Proposal, Crystal Video Alert/Collection Unit

Antennas: Mounting - Crystal video antennas to be flanged mounted within a fiber-glass cylinder unit covering the range 1 kmc through 40 kmc. Antennas for the range 1 kmc to 50 mcs to be externally fixed to this structure. Subject structure to be of size, strength and configuration to permit mounting atop a PT-boat type craft. Four antennas are required for each frequency range to provide 360° coverage with 90° sensing.

50 to 250 mcs - four each radome protected helical ribbon beam (this frequency division based on alert considerations for priority coverage by an area) with crystal detector.

250 to 500 mcs - four each radome protected helical ribbon beam with crystal detector.

500 to 1000 mcs - four each radome protected helical ribbon beam with crystal detector.

Alternate antennas for bands 50 to 1000 mcs:

It has been determined technically feasible to include a recommendation for alternate antennas for the above three frequency ranges. This is by means of a re-scale of the PRC countermeasure antennas and reduction from their multi-element construction to a four element (quadrant balun closed loop configuration).

Physical and electrical comparisons are being co-ordinated with PRC so that an early choice can be determined. This configuration will provide a minimum of 2 db greater gain than can be achieved by a full doublet antenna and somewhat more than this when compared to broadband stub type antenna.

- 1 to 2 kmc - 4 each horns based on NRL drawings with crystal detectors.
- 2 to 5 kmc - 4 each horns based on NRL drawings with crystal detectors
- 5 to 10 kmc - 4 each horns based on NRL drawings with crystal detectors
- 10 to 20 kmc - 4 each horns based on NRL drawings with crystal detectors
- 18 to 26.5 kmc - 4 each horns and crystal detectors (Horns to be Airtron part number 68062; crystal detector to be commercial model recommended by antenna manufacturer).
- 26.5 to 40 kmc - 4 each horns and crystal detectors (Horns to be Airtron part number 68061; crystal detector to be commercial model recommended by antenna manufacturer).

/All horn antennas to have aperture oriented at 45° angle from vertical so as to permit response to both horizontal and vertical polarized signals - this to be at a 3 db loss of overall sensitivity/

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Crystal Video Amplifiers, etc.

50 mc to 1000 mcs

Video amplifiers for this range to be basically the AN/ULR-3 type amplifiers modified in form to provide for plug-in shock mounting arrangement; to include a video output arrangement to permit operator utilizing a pulse analyzer applique unit when available; to include an "alert" control outlet to indicate both the condition of radar illumination and to assist ELINT operators in picking up targets on more discrete equipments. Four amplifiers are required for each antenna range. Low frequency cutoff to be reduced from 20 kcs to 100 cps for this antenna range. Bandpass to be in the order of 750-800 kcs.

1000 to 10000 mcs

Video amplifiers for this range to be basically the AN/ULR-3 type amplifiers modified in form to provide for plug-in shock mounting arrangement; to include a video output arrangement to permit operator utilizing a pulse analyzer applique unit when available; to include an "alert" control outlet to indicate both the condition of radar illumination and to assist ELINT operator in picking up targets on more discrete equipments. Four amplifiers are required for each antenna range. Low frequency cutoff is retained in this frequency range at 20 kc so as to reduce crystal noise; necessary shunt and series peaking coils are included in circuitry to increase video bandpass to an order of 3.5 to 4 mcs.

10000 to 40000 mcs

Video amplifier for this range to be designed to provide a video band pass of 12 mcs; form to provide for plug-in shock mounting arrangement; to include video output arrangement to permit operator utilizing a pulse analyzer applique unit when available; to include an "alert" control outlet to indicate both the condition of radar illumination and to assist ELINT operator maintaining operation logs. Circuitry for this amplifier incorporates features of the AN/ULR-3 and the Linear Equipment Lab LO-C HF-3 Oscilloscope.

Power Supplies

A common power supply to be provided for each set of antennas (one per frequency range). Power supplies to be in form to provide for plug-in shock mounting arrangement.

50 mc to 10000 mc ranges to have interchangeable power supplies for the amplifiers concerned.

Amplifier units above 10 kmcs to have interchangeable power supplies within this range, but will be of a regulated design not interchangeable with the video amplifiers used on the lower frequency ranges.

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Audio Recording

Audio recording provision will be included to permit audio output being available from each individual amplifier; operator simultaneous monitoring is likewise required being available; for this application combined recording of all video units arrangement is required; provision must be included so that additional breakdown is possible when recording facilities are available; thus permitting at some future date to assign a single recorder channel to each antenna frequency range. In general the recorder output arrangement should be such as to envisage individual recording of each frequency range and with loudspeaker monitoring of the combined received signals from one to include all receiving ranges at one time.

Alert Panel

Quadrant alert lamps are to be actuated by each individual antenna unit by means of an activated relay (or other suitable arrangement) so as to notify the manned equipment operators as to the quadrant from which signals are being received, it will be further arranged so as to designate the frequency band on which the signal is being employed.

For the purpose of this system two manned positions are established. Position 1 will be alerted by those signals falling within the frequency range 50 to 1000 mcs; position 2 will be alerted to those falling within 1 to 10 kmc; an additional indicator panel is required covering those signals occurring in the bands above 10 kmc so as to permit operators maintaining logs as to band and quadrant in which signals are received. The possibility exists that this shall at a future date be expanded into position no. 3.

Special Accessories

Coaxial T-couplers will be provided to permit adequate field determination of the operational advantages of port and starboard sensing versus quadrant sensing as well as the negative aspects thereof.

Combined (Omni-directional) double T-couplers to be provided to permit a determination of operational advantage of quadrant sensing versus omni-directional usage. The employment of this feature is known to reduce the antenna collection sensitivity (as employed on the quadrant basis) by the amount of 5 db, actual operational loss is to be established by the field since this loss, if acceptable, (and no advantages are gained by quadrant sense knowledge) will reduce amplifier requirements from four per frequency channel to one per frequency channel.

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Specific Proposal, Superhetrodyne "Manned" Equipments Pos. 1 & 2

Antennas:

40 to 300 mcs 2 each Navy CAGW-66132

300 to 1000 mcs 2 each Navy CAGW-66131

Mounted at 45° from vertical with a minimum of six feet between antennas of the same type. Antenna output routed to position 1. Omni-directional coverage provided.

1 kmc to 10 kmc 1 each countermeasure antenna as made by Production Research Corporation, mounted vertically one above the other to provide in three bands omni-directional collection and port and starboard sensing ability. PRC part numbers 687-10; 687-20; and 687-30.

Receivers:

1 each Navy RDO for position 1

1 each Navy AN/SPR-2 for position 2

Panoramic adapters:

2 each Navy RDP panoramic adaptor (1 per position)

Pulse analyzers:

2 each Navy RDJ-1 pulse analyzer (1 per position)

Accessories:

Wave traps for RDO receiver FS-19/UPR and FS-20/UPR

Antenna Jack panel type J-116/SPR (1 per position)

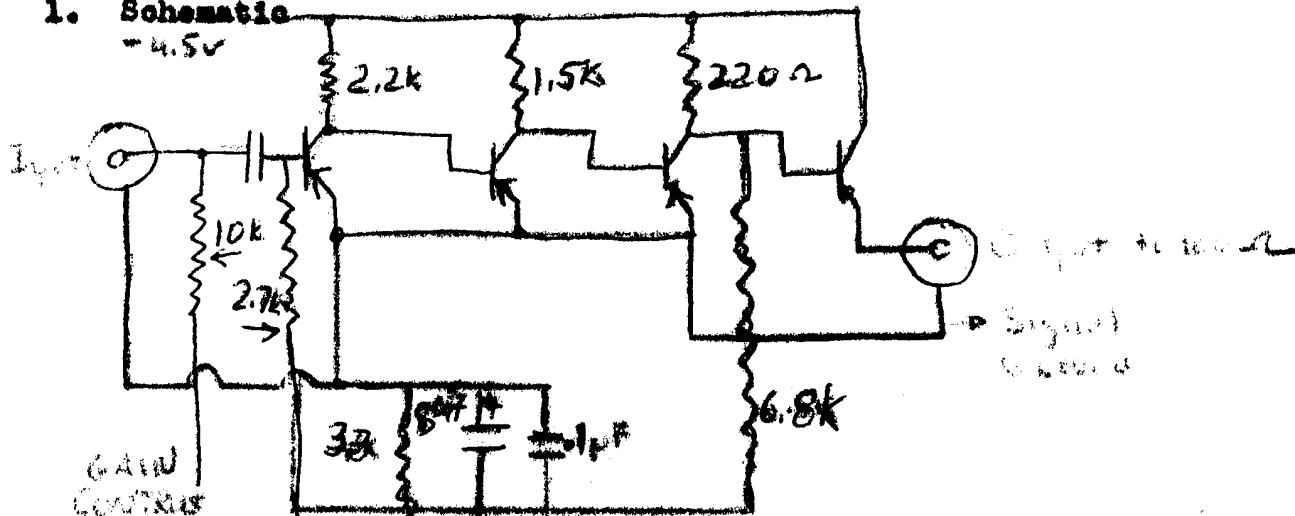
RF switch type SA-44A/APR (2 for position 1 and 3 for position 2).

Special Proviso

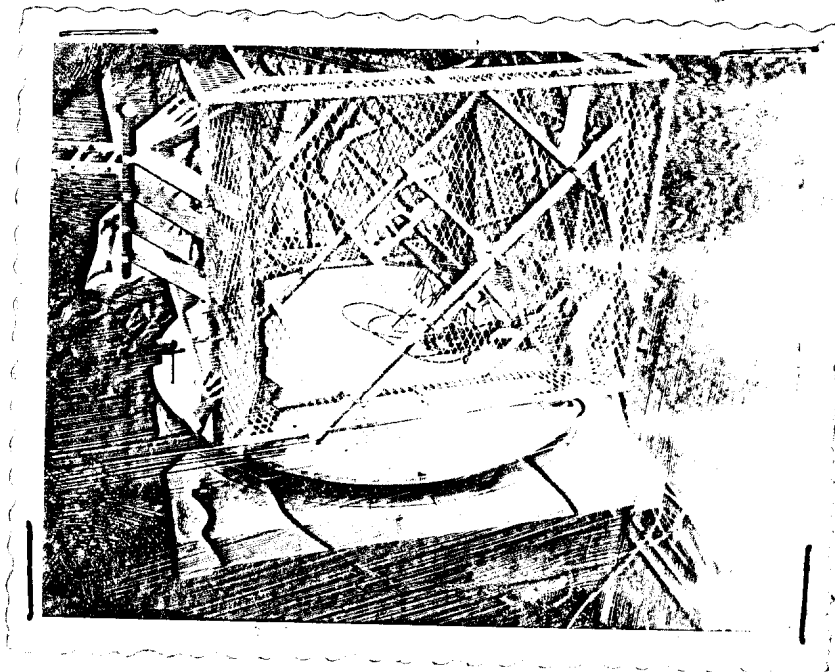
Except for specific power considerations; antenna mounting considerations; and the decision that recording (at least initially) facilities will be those available to the field; the system concept is closely related to the air-borne crystal video receiving system proposal submitted 26 November 1954.

Therefore, future considerations for multi-channel recording are foreseen, as is the time reference considerations and recordable quadrant data. The basic amplifiers, a major portion of the antennas, can be directly interchanged with those established for air-borne operations. The power supplies will not be directly interchangeable. The multi-channel recorder elements, excepting motors, will be basically interchangeable.

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Instructions For 750Kc Video Preamplifier**1. Schematic**

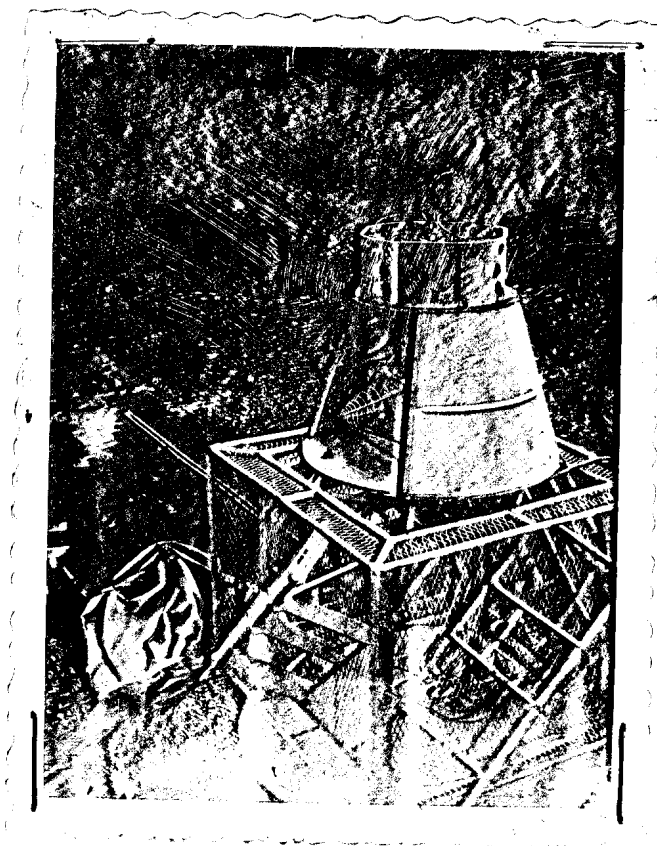
2. Connect amplifier as shown in above schematic diagram. RG62/U cable should be used for input and output leads.
3. The output cable should be terminated in its characteristic impedance (100 ohms).
4. Gain control, if used, should be connected to -4.5V through 500K potentiometer. The optimum bias for 1N230 Crystal is 40 microamperes at -.16 volts (brown lead).
5. Battery voltage should not exceed -5 volts (blue lead).
6. All grounding should be accomplished through signal grounds.



Detail view of the "bird cage" with the crossed dipoles of bands 1 and 2. Band 2 is the small folded dipole at the center of the reflector, and running from upper left to lower right.

The angle screen shown with the man's hand is a shield to prevent interaction between the antenna group of the adjacent quadrant.

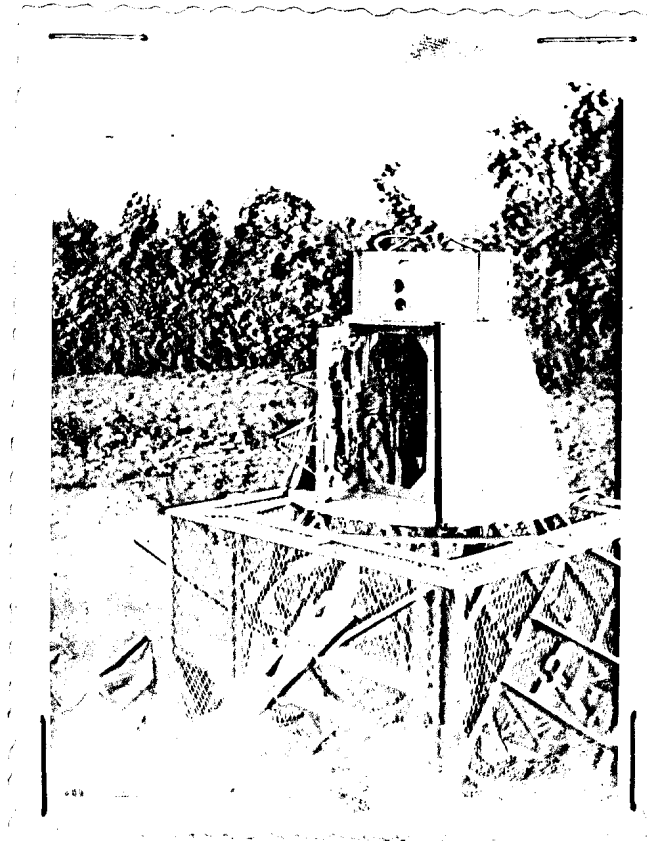
①



Antenna system with top cover and one side panel removed to expose the ports at the top for the high frequency horns, bands 6, 7, and 8, and to show the tapered helix antennas for bands 3, 4, and 5.

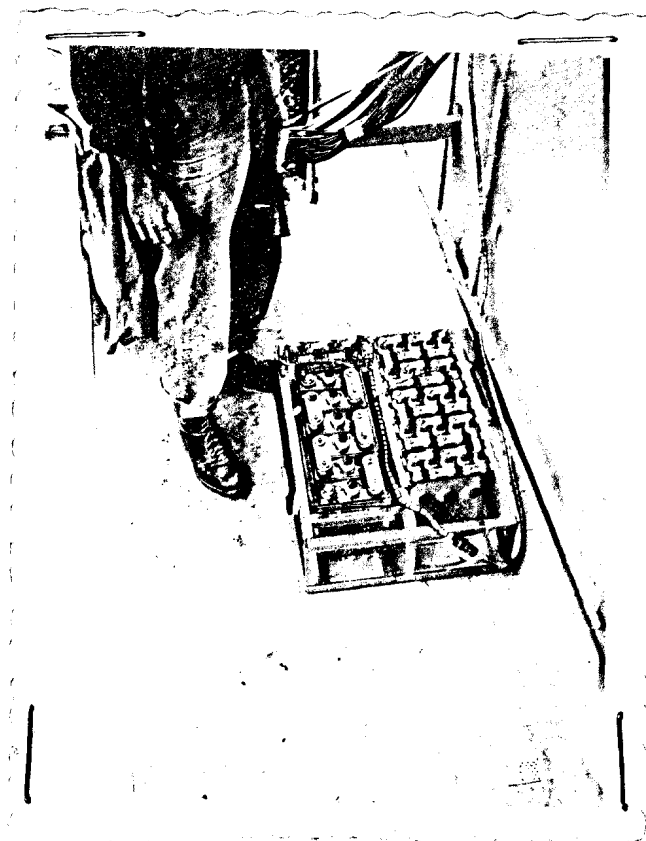
The crossed dipoles for bands 1 and 2 are shown on the "bird cage" at the bottom.

②



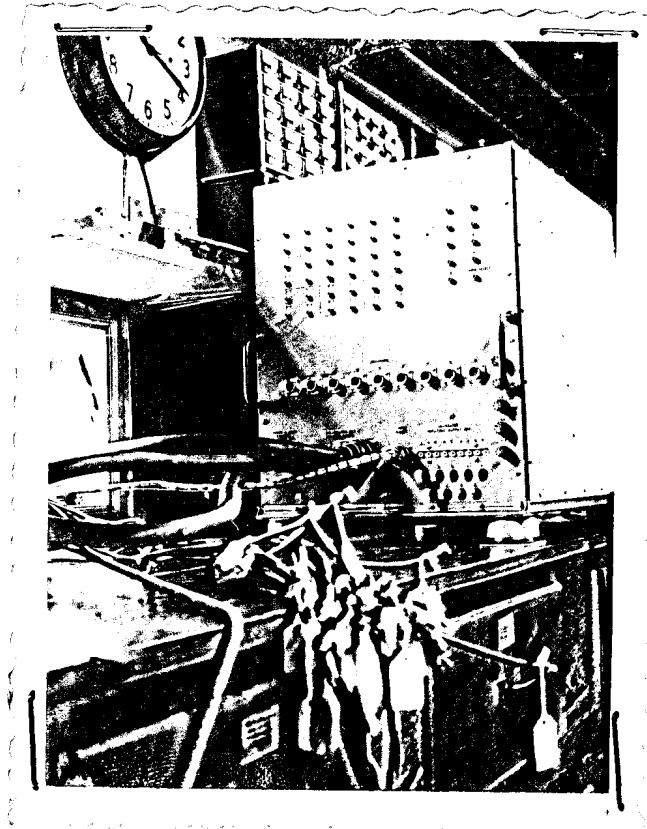
One quadrant mounting panel is swung open to show the manner of access to the filters, preamplifiers, and the calibration system.

③



Battery pack used to power the entire system. In service, these will be protected by a cover. A recharger, which may be in operation during normal equipment operation, is not shown.

④



Rear panel of the console unit.

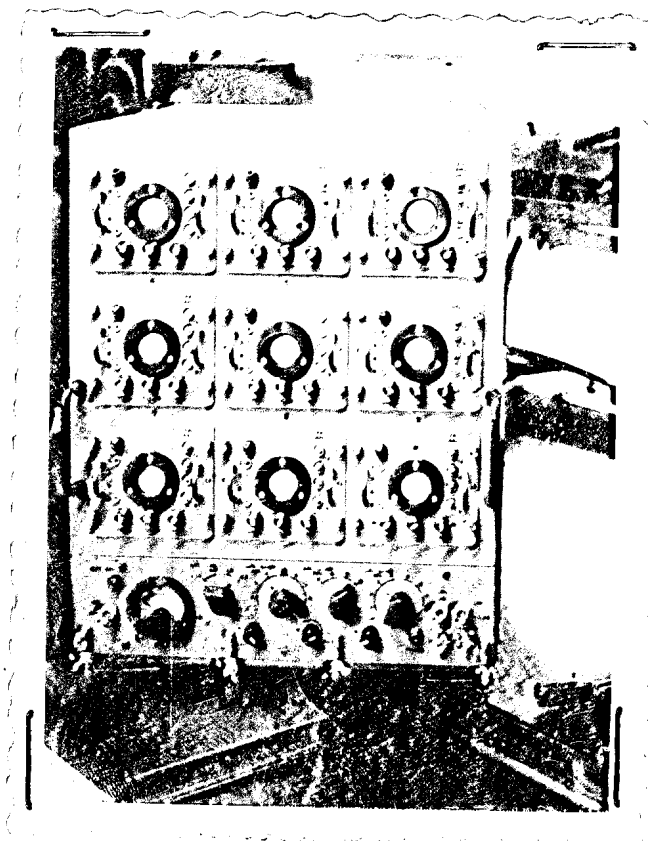
Antenna input (from the video preamplifiers) shown at upper left.

Video out shows at upper right.

Audio out (from pulse stretchers) shown in line across the back between the handles.

Power, and other control cables attach at the bottom.

⑤



Front view of the console unit

Each of the nine CRT units are identical and interchangeable.

Meter at bottom left is for battery voltage, and is calibrated to indicate the condition of the NiCad batteries.

Switches across the bottom control the calibrator, selection of video channel for pulse analysis, headphone selection, alarm circuits, and camera actuate.

⑥

25X1

22.8 weeks Senior Engineer	\$ 3,739.20
16.0 weeks Mechanical Engineer	2,160.00
14.8 weeks Development I Engineer	1,850.00
96.4 weeks Machinist	8,676.00
26.0 weeks Technician	2,184.00
11.0 weeks Drafting	<u>968.00</u>
	\$ 19,577.20
Overhead 95%	18,598.34
Materials	18,414.00
Travel and Communications	210.00
Shipping and Crating	<u>300.00</u>
	\$ 57,099.54
Fixed Fee 7%	<u>3,996.96</u>
TOTAL	\$ 61,096.50

SUBCONTRACT 55-4



25X1



25X1



25X1



SUBCONTRACT NO. 55-4

PRIME CONTRACT [REDACTED]

25X1

CONTRACTUAL AGREEMENT FOR GOVERNMENT SPONSORED RESEARCH AND DEVELOPMENT WORK.

PREAMBLE:

AGREEMENT made this twenty-fourth day of

[REDACTED]

25X1

WHEREAS, [REDACTED] has contracted with the UNITED STATES OF AMERICA, hereinafter referred to as the "Government", for research and development work covering:

25X1

Construction of three (3) prototype models of antenna system and crystal holders for Passive Intercept Receiving System

under [REDACTED], hereinafter referred to as the "Prime Contract";

25X1

WHEREAS, [REDACTED] desires to subcontract a related field of this work to the Contractor for its development;

25X1

The Contractor shall, within the period of time specified herein, furnish and supply to [REDACTED] the services, articles, data and reports hereinafter described:

25X1

- Item 1 Three (3) prototype models of antenna system and crystal holders for Passive Intercept Receiving System.
- Item 2 Manuscript material and engineering sketches for Instruction and Operation guide.

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- Item 3 One (1) set of engineering sketches for preparation of design drawings.
- Item 4 Complete informal parts list.
- Item 5 Informal monthly letter report of progress.
- Item 6 Performance tests.
- Item 7 Test report covering performance tests.
- Item 8 Experimental models and residual material.

Hereinafter, the above will be referred to as the "Subject", the same to be developed and designed with the aid and advice and subject to the control of the [] Engineering Department; and

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WHEREAS, both parties hereto desire to stimulate such development by a free exchange of information between them and to provide for the ownership of inventions made in or incidental to such development, or resulting therefrom;

NOW, THEREFORE, THIS AGREEMENT WITNESSETH, that said parties hereto have mutually covenanted and agreed to and with each other as follows, both parties intending to be legally bound hereby:

(1) NATURE
OF
WORK

The Contractor agrees to pursue research and development on the Subject as outlined in the attached "Work Schedule", Exhibit "B". Representatives of [] shall have access to such locations of the Contractor wherein the work under this contract is being performed.

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(2) DURATION
OF
WORK

The Contractor agrees to actively and diligently undertake and carry on during the period from 24 August 1955 to 30 April 1956 for [] and for the Government, the development of and construction of and the delivery to [] of the equipment heretofore designated as the "Subject".

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(3) SECURITY
REQUIREMENTS

- (a) Information concerning the work covered by this agreement shall not be disclosed by the Contractor outside of its own organization without written permission from [] The work contracted for hereunder relates to and is connected with the national defense. It is understood that disclosure of information relating to this work to any person not entitled to receive it, or failure to safeguard all secret and confidential matter that may come to the Contractor, or any person under his control in connection with the work under this contract, may subject the Contractor, his agents, employees and subcontractors to criminal liability under the laws of the United States (Act of 25 June 1948, c.645, 62 Stat. 862, as amended).
- (b) The equipment and instruction books furnished under this contract shall be considered UNCLASSIFIED. The engineering reports and the association of the government organization with the contract shall be classified SECRET.
- (c) The provisions of the following paragraphs of this section shall apply only if and to the extent that this contract involves access to matter classified "Top Secret", "Secret" or "Confidential".
1. The contractor agrees to provide and maintain a system of security controls within its or his own organization in accordance with (i) the requirements of the Industrial Security Manual for Safeguarding Classified Security Information, as in effect on date of this contract, which Manual is hereby incorporated by reference and made a part of this contract, and (ii) any amendments to said Manual required by the demands of national security as determined by the Government and made after the date of this contract, notice of which has been furnished to the Contractor.

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2. [] agrees that it shall indicate when necessary by classification ("Top Secret", "Secret", or "Confidential"), the degree of importance to the national defense of information pertaining to supplies, services, and other matters to be furnished by the Contractor to [] to the Contractor, and [] shall give written notice of such classification to the Contractor and of any subsequent changes thereof. 25X1 25X1

3. Designated representatives of the Government or [] responsible for inspection pertaining to industrial plant security shall have the right to inspect at reasonable intervals the procedures, methods, and facilities utilized by the Contractor in complying with the requirements of the terms and conditions of this section. Should the Government or [] through its authorized representative, determine that the Contractor's security methods, procedures, or facilities do not conform to such requirements, it shall submit a written report to the Contractor advising him of the proper actions to be taken in order to effect compliance with such requirements. Any disagreement concerning a question of fact arising under this section shall be considered a dispute within the meaning of Section (13) of this contract entitled "Disputes". 25X1 25X1

(4) TOTAL AMOUNT
AND MANNER
OF
REIMBURSEMENT

- (a) [] agrees to reimburse the Contractor for all allowable costs incurred during the performance of the subject development to a total amount of \$57,099.54, and [] shall pay the Contractor a fixed fee of \$3,996.96 in full consideration for its services in the performance of the contract. 25X1 25X1
- (b) The total consideration shall not exceed \$61,096.50, except upon written approval of [] shall not be liable for any amount expended or claimed by the Contractor in excess thereof, and the contract will terminate unless additional funds are approved by [] 25X1 25X1

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- (5) OVERTIME The Contractor shall obtain written permission from [] prior to the use of overtime. 25X1
[] will consider requests for allotment of 25X1
lump sums of money without increasing the contract price, to cover the premium portion of overtime payments as an allowable cost.
- (6) LIMITATIONS OF ALLOWABLE COST If at any time the Contractor has reason to believe that the cost to be incurred by it in the performance of this sub-contract in the next succeeding 60 days, when added to all previous cost, will exceed eighty-five per cent (85%) of the estimated cost of performance, or if at any time, the Contractor has reason to believe that the total cost for the performance of this contract will be substantially greater or less than the estimated cost, the Contractor will notify [] to that effect, giving a new estimate of the total expenditures required to perform this contract, together with an appropriate breakdown of such estimate and a statement setting forth the reasons if an increase in cost is anticipated, so that at the discretion of [] and the Government, an appropriate increase may be made in the contract estimated cost. 25X1
25X1
- (7) BILLING PROCEDURE (a) The Contractor shall invoice [] at the end of each month for the costs incurred during the month and [] shall pay up to eighty-five per cent (85%) of the fixed fee in installments at the time of each provisional payment on account of Allowable Cost, the amount of each installment thus payable to be equal to the proportion of said eighty-five per cent (85%) that the related provisional payment on account of allowable cost bears to the total estimated cost of performance of this contract. Upon completion of the work and its final acceptance, the unpaid balance of the fee, subject to adjustments thereof, which may be made as herein provided, shall be paid to the Contractor, except as modified in Section (14) TERMINATION below. 25X1
25X1
- (b) The payments specified in this section shall be deemed to be in full consideration for the products, information, and rights herein referred to.

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(c) All invoices submitted under this contract shall be supported by a summary of expenses by major expense classifications; such summaries shall include a separate indication of any expenditures for purchased facilities of a special nature, such as special test equipment, tools, dies, jigs, fixtures, etc.

(d) Invoices and any required supporting statements, each showing the number of this contract and the [] Prime Contract number, are to be submitted by the Contractor to the [] contract administrator, with three (3) copies, for review and preparation of an authorization for payment, whereupon it will be forwarded to the cognizant [] engineer for certification as to acceptance, and thereafter will be forwarded to the Government Accounting Section of Philco for payment.

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(e) Invoices submitted under this contract are to be prepared by the Contractor on its regular billing forms. In order to prevent disclosure of classified information, invoices shall be so prepared that the services covered can be identified only by reference to the contract.

1. There is required to be stamped, printed or typewritten upon the original copy of each invoice the following certification:

I certify that the above bill is correct and just and that payment therefor has not been received.

Company name _____

Signature _____ Title _____

2. Each invoice must bear a legend in substantially the following form:

"We hereby certify that the goods or services which are the subject of this invoice have been produced or

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rendered in full compliance with the provisions of the Fair Labor Standards Act of 1938, as amended."

(8) ASSIGNMENTS

The Contractor must obtain permission in writing from [] before making any assignment of claims arising under this contract. In the event such assignment is authorized, the Contractor, not the assignee, is required to prepare invoices. Where such an assignment has been made, the original copy of the invoice must refer to the assignment and must show that payment of the invoice is to be made directly to the assignee. Information contained in plans, specifications, or in this contract which is marked Secret or Confidential shall not, in connection with the assignment of any claim under the contract, be disclosed to any person not otherwise entitled to receive it; provided, that a copy of any part or all of this contract so marked may be furnished, or any information contained therein may be disclosed, to such assignee upon the prior written authorization of the Government Contracting Officer for the Prime Contract.

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(9) RECORDS

- (a) The contractor agrees to maintain books, records, documents and other evidence pertaining to the costs and expenses of this contract (hereinafter collectively called the "records") to the extent and in such detail as will properly reflect all net costs, direct and indirect, of labor, materials, equipment, supplies and services, and other costs and expenses of whatever nature for which reimbursement is claimed under the provisions of this contract. The Contractor's accounting procedures and practices shall be subject to the approval of the Government; provided, however, that no material change will be required to be made in the Contractor's accounting procedures and practices if they conform to generally accepted accounting practices and if the costs properly applicable to this contract are readily ascertainable therefrom.
- (b) The Contractor agrees to make available at

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the office of the Contractor at all reasonable times during the period set forth in paragraph (d), below, any of the records for inspection, audit or reproduction by the Government.

- (c) In the event the Government determines that the audit of the amounts reimbursed under this contract as transportation charges will be made at a place other than the office of the Contractor, the Contractor agrees to deliver, with the reimbursement voucher covering such charges, or as may be otherwise specified within two (2) years after reimbursement of charges covered by any such voucher, to such representative as may be designated for that purpose such documentary evidence in support of transportation costs as may be required by the Government.
- (d) Except for documentary evidence delivered to the Government pursuant to paragraph (c), above, the Contractor shall preserve and make available its records for a period of six (6) years (unless a longer period of time is provided by applicable statute) from the date of the voucher or invoice submitted by the Contractor after the completion of the work under the contract and designated by the Contractor as the "completion voucher" or "completion invoice", or in the event this contract has been completely terminated, from the date of the termination settlement agreement; provided, however, that records which relate to (i) appeals under Section (13) of this contract entitled "Disputes", (ii) litigation or the settlement of claims arising out of the performance of this contract, or (iii) costs or expenses of the contract as to which exception has been taken by the Comptroller of the Contracting Government Agency or his authorized representatives, shall be retained by the Contractor until such appeals, litigation, claims, or exceptions have been disposed of, but in no event for less than the six-year period mentioned above.

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- (e) Except for documentary evidence delivered pursuant to paragraph (c) above, and the records described in the proviso of paragraph (d) above, the Contractor may in fulfillment of its obligation to retain its records as required by this clause, substitute photographs, micro-photographs or other authentic reproductions of such records, after the expiration of two years following the last day of the month of reimbursement to the Contractor of the invoice or voucher to which such records relate, unless a shorter period is authorized by the Government.
 - (f) The provisions of this Section (9), including this paragraph (f), shall be applicable to and included in each subcontract hereunder which is on a cost, cost-plus-a-fixed-fee, time-and-material or labor-hour basis.
 - (g) The Contractor further agrees to include in each of his subcontracts hereunder, other than those set forth in paragraph (f) above, a provision to the effect that the subcontractor agrees that the Government shall, until the expiration of three (3) years after final payment under the subcontract, have access to and the right to examine any directly pertinent books, documents, papers, and records of such subcontractor involving transactions related to the subcontract. The term "subcontract", as used in this paragraph (g), only, excludes (i) purchase orders not exceeding \$1,000 and (ii) subcontracts or purchase orders for public utility services at rates established for uniform applicability to the general public.
- (10) IDENTIFICATION OF AND TITLE TO EQUIPMENT (a) Title to all property purchased by the Contractor, for the cost of which the Contractor is entitled to be reimbursed as a direct item of cost under this contract, shall pass to and vest in the Government upon delivery of such property by the vendor. Title to other property, the cost of which is reimbursable to the Contractor under this contract, shall pass to and vest in the Government upon (i) issuance for use or commence-

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ment of use of such property in the performance of this contract, or (ii) reimbursement of the cost thereof by [redacted], whichever first occurs. The Contractor shall maintain adequate property control records of the government property in its possession in accordance with the provisions of the "Manual for Control of Government Property in Possession of Contractors" as in effect on the date of this contract, which is incorporated herein by reference.

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(b) The Contractor further covenants that it shall list periodically, or at the termination of this contract, all equipment built or purchased for this work and charged to Philco. This list shall be submitted to Philco who may require that the equipment be transferred without further compensation, to [redacted] at any time up to one year after the completion of the contract.

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(c) The Contractor is hereby granted the option to retain any tools, dies, etc., (purchased under this contract) at the termination of the contract, provided that the full cost of such tools, dies, etc., is credited to the cost of the work covered by the contract in a manner acceptable to the Contracting Officer for the Prime Contract.

(11) INSURANCE
COVERAGE
OF
GOVERNMENT
PROPERTY

The contractor agrees to carry insurance (fire and extended coverage) against the usual risks of loss of any property, title to which shall be in the Government, while within the premises of the Contractor. Such insurance shall be payable to the Contractor, [redacted] and the Government as their interests may appear.

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(12) GOVERNMENT
SUBCONTRACT
RESPONSIBILITIES

It is understood by the Contractor that the work called for under this contract represents a subcontract under a certain contract entered into by [redacted] and the United States Government. The Contractor shall give advance notification to the Government Contracting Officer for the Prime Contract via [redacted] and receive written approval before entering into any subcontract or purchase order incident to the performance of this contract which

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- (i) is on a cost or cost-plus-fixed-fee basis; or
- (ii) is on a fixed price basis exceeding in dollar amount either \$25,000.00 or five per cent (5%) of the total estimated cost of the contract; or
- (iii) is for research and development work.

(13) DISPUTES

"Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Government Contracting Officer for the Prime Contract, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Contractor. Within thirty (30) days from the date of receipt of such copy, the Contractor may appeal by mailing or otherwise furnishing to the Contracting Officer a written appeal addressed to the Director of the Government Contracting Agency, and the decision of the Director or his duly authorized representative for the hearing of such appeals shall be final and conclusive; provided that, if no such appeal is taken, the decision of the Government Contracting Officer shall be final and conclusive. In connection with any appeal proceeding under this clause, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support to its appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the contract and in accordance with the Government Contracting Officer's decision."

(14) TERMINATION

reserves the right to discontinue the work of the Contractor on the "Subject" at any time and under those circumstances shall be liable only for allowable costs theretofore incurred by the Contractor, a percentage of the fixed fee equivalent to the percentage of the completion of work contemplated by the sub-contract less fixed fee payments previously made, and such costs as may continue for a reasonable time after termination with the approval of or as directed by

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(15) PATENTS,
INVENTIONS,
AND
IMPROVEMENTS

- (a) The Contractor recognizes and declares that any and all inventions and improvements that shall hereafter be made or conceived relating to the "Subject" during the term of this contract, or developed in connection therewith, by the Contractor or by the Contractor's engineers or other employees, whether alone or jointly with employees of [redacted] shall be for the exclusive benefit of [redacted]; and the Contractor covenants and agrees that it shall and will promptly furnish to [redacted] complete information covering all such inventions and improvements, and that it shall and will, upon request of [redacted] promptly execute or procure the execution of, any and all assignments necessary to vest on [redacted] its nominee, and its or their successors or assigns, without cost or charge to [redacted], the entire right, title and interest, both for the United States and all foreign countries, in, to and under any and all such inventions and improvements, and all letters patent of the United States and any foreign countries which shall have been issued therefor, or for any thereof, and as well any and all instruments in the opinion of [redacted] necessary to enable [redacted] itself to procure for said inventions such letters patent, in the United States and foreign countries, as [redacted] shall elect.
- (b) The Contractor agrees to exert all reasonable effort to negotiate for the inclusion in any subcontract hereunder of \$3,000 or more, in which payment is to be made for experimental, developmental or research work, of this patent rights clause or one approved by [redacted]. The Contractor agrees to notify [redacted] in writing of any subcontract containing a patent rights clause, to furnish to [redacted] a copy of such clause, and promptly to notify [redacted] when such subcontract is completed.

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- (16) EMPLOYEE'S
PATENT
AGREEMENT
- The Contractor further covenants that it shall and will require of and secure from each and all of its employees who shall be engaged upon or in connection with the Subject, directly or indirectly, an agreement in writing on the Contractor's form "Agreement for Assignment of Inventions", a blank copy of which is appended hereto as Exhibit "A".
- (17) SMALL
BUSINESS
- It is the policy of the Government as declared by the Congress to bring about the greatest utilization of small business concerns which is consistent with efficient production. The Contractor agrees to accomplish the maximum amount of subcontracting to small business concerns that the Contractor finds to be consistent with the efficient performance of this contract.
- (18) NONDISCRIMI-
NATION IN
EMPLOYMENT
- (a) In connection with the performance of work under this contract, the Contractor agrees not to discriminate against any employee or applicant for employment because of race, religion, color, or national origin. The aforesaid provision shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.
- (b) The Contractor further agrees to insert the foregoing provision in all subcontracts hereunder, except subcontracts for standard commercial supplies or raw materials.
- (19) EIGHT-HOUR LAW
- This contract, to the extent that it is of a character specified in the Eight-Hour Law of 1912 as amended (40 U.S. Code 324-326) and is not covered by the Walsh-Healey Public Contracts Act (41 U.S. Code 35-45), is subject to the following provisions and exceptions of said Eight-Hour Law of 1912 as amended, and to all other provisions and exceptions of said law:

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No laborer or mechanic doing any part of the work contemplated by this contract, in the employ of the Contractor or any subcontractor contracting for any part of the said work, shall be required or permitted to work more than eight hours in any one calendar day upon such work, except upon the condition that compensation is paid to such laborer or mechanic in accordance with the provisions of this clause. The wages of every such laborer and mechanic employed by the Contractor or any subcontractor engaged in the performance of this contract shall be computed on a basic day rate of eight hours per day and work in excess of eight hours per day is permitted only upon the condition that every such laborer and mechanic shall be compensated for all hours worked in excess of eight hours per day at not less than one and one-half times the basic rate of pay. For each violation of the requirements of this clause, a penalty of five dollars shall be imposed upon the Contractor for each such laborer or mechanic for every calendar day in which such employee is required or permitted to labor more than eight (8) hours upon said work without receiving compensation computed in accordance with this clause, and all penalties thus imposed shall be withheld for the use and benefit of the Government.

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Employee

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*Patent Rights Agreement
to be included here
as Exhibit A*

EXHIBIT B
WORK SCHEDULE
SUBCONTRACT 55-4
PRIME CONTRACT [REDACTED]

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1. INTRODUCTION

This Work Schedule contains the technical description of the work to be undertaken and material to be furnished to [REDACTED] Corporation as well as the delivery schedule for this material.

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1.1 REFERENCES

- (a) [REDACTED]
- (b) Military Specification MIL-E-16, 400, Electronic Equipment, Naval Ship and Shore: **General Specification.**
- (c) Military Specification MIL-T-17113, Tests; Shock, Vibration, and Inclination (for Electronic Equipment) **General Specification.**
- (d) Military Specification MIL-T-5422C, Testing; Environmental Aircraft Electronic Equipment.
- (e) Military Specification MIL-R-978 (Ships), Reports and Microfilm: Research and Development (for Electronic Equipment).
- (f) [REDACTED] dated 20 July 1955.

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1.2 PRECEDENCE

When the requirements of this Work Schedule are in conflict

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with the applicable specifications referenced herein, the Work Schedule shall have precedence.

1.3 CHANGES IN DESIGN REQUIREMENTS

Both parties agree to confer as necessary to review the work accomplished and to determine the direction of the future work. Revisions in scope of work in design, construction and/or specification details and clarification thereof shall be determined by mutual agreement in these conferences and shall be confirmed in writing by the party requesting the revisions.

1.4 AMENDMENTS

The specifications, designs, or quantities applicable to any of the items covered by this Work Schedule, or any provisions with respect to the time or place of delivery, may be changed at any time by a written amendment. The amendment shall be acceptable to both [] subject to the approval of the Government Contracting Officer for the Prime Contract. 25X1

1.4.1 When a request for a change is made by either party, [] shall submit to [] an itemized statement of the estimated cost and on any other relevant contract provisions. 25X1
If the proposed change is acceptable to [], an appropriate adjustment in the estimated cost, and any other relevant contract provisions, shall be incorporated in an amendment to this contract. 25X1

1.4.2 If the scope of the work to be performed by [] is altered by a change in specifications or quantities applicable to any of the items covered by this Work Schedule, an adjustment to the fixed fee shall be made proportionate to the adjustment in estimated cost for the change in the scope of the work. After such an amendment is agreed upon by [] and [], it shall be submitted to the Government Contracting Officer for the Prime Contract for approval. 25X1
25X1

1.5 COMPLETENESS OF THESE SPECIFICATIONS

Because of the development nature of this job some of the specifications are not complete. It is understood that they will be completed later by mutual agreement as the work progresses and the requirements become firm. It is also possible that some minor specifications have been om-

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-3-

mitted or overlooked at this time and they will be supplied later by mutual agreement. The addition of this information would not therefore be considered as change in scope but merely as the completion of these specifications.

2. SCOPE OF WORK

[] shall within the period of time specified in Section 6, DELIVERIES, furnish and supply to [] the services, articles, data and reports hereinafter summarized.

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2.1 Item 1 EQUIPMENT

[] shall construct and/or supply three (3) prototype models of each of the following:

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(a) Antenna system for Passive Intercept Receiver consisting of four (4) antennas for each of eight (8) frequency bands, together covering the range from fifty (50) to forty thousand (40,000) megacycles, a total of thirty-two (32) antennas.

(b) Crystal holders and crystals for each antenna.

(c) Antenna housing for above antenna system.

2.2 Item 2 INSTRUCTION AND OPERATION GUIDE

[] shall provide one (1) set of manuscript material and engineering sketches prepared in accordance with [] standard practice for use by [] in the preparation of an Instruction and Operation guide for []. The manuscript shall cover the theory of operation of the units constructed under Item 1 above. Three dimensional [] drawings shall be included for instructional purposes. A maintenance schedule and test data shall be supplied, plus any other pertinent information necessary to enable skilled personnel to operate and maintain the equipment.

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2.3 Item 3 DESIGN DRAWINGS

[] shall provide one (1) each, set of prints and reproducible drawings (white background) covering the equipment specified in Item 1. These drawings shall be prepared in accordance with [] standard practice and shall be suf-

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ficient for inclusion by [] in the set of design drawings for [] for delivery to the government. They are to include procurement, detail, assembly and outline drawings, especially the following:

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25X1

- (a) Detail drawings of all items used in the equipment, except those items found in the Standards of the Armed Services or in the [] Standards Book.
- (b) Mechanical assemblies or sub-assemblies where welding, riveting or locating of items dimensionally with respect to each other is required.
- (c) Nomenclature or symbolized assemblies of details or sub-assemblies.

25X1

2.4 Item 4 PARTS LIST

[] shall provide two (2) copies of an informal assembly breakdown parts list covering the equipment specified in Item 1.

25X1

2.5 Item 5 PROGRESS REPORTS

[] shall provide a monthly Letter Report of Progress. This report shall include technical information and a report of the status of work on the individual units. In addition, expenditures of funds and man-hours of work shall be reported in a manner to be prescribed by Philco.

25X1

The content of these reports shall not be disclosed except to Philco.

2.6 Item 6 PERFORMANCE TESTS

[] shall make the following performance tests upon the antennas individually and together as a complete system.

25X1

- (a) Pattern measurements in horizontal plane.
- (b) Pattern measurements in vertical plane.
- (c) Antenna gain.
- (d) Impedance matching (VSWR) measurements.

-4-

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2.7 Item 7 TEST REPORT

[] shall furnish a test report or reports covering the results obtained from the performance tests specified in Item 6. Specification MIL-R-978 (Ships) shall be used as a guide in preparing this report.

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2.8 Item 8 RESIDUAL MATERIAL

[] shall deliver to [] all excess material, including "breadboard" or engineering models, in order to enable [] to account to the government for all materials purchased.

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3. MILITARY CLASSIFICATION OF WORK3.1 DISCLOSURE

The work to be undertaken by [] shall not be disclosed outside its own organization except to []. The nature of the work performed by [] shall not be used for promotional purposes.

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3.2 IDENTIFICATION

The equipment to be constructed by [] shall have no identification as to its purpose or origin.

25X1

3.3 CLASSIFICATION

All information concerning the work done by [] shall be UNCLASSIFIED except the following, which shall be SECRET:

25X1

(a) Use of the equipment.

(b) []

25X1

4. INFORMATION AND MATERIAL TO BE SUPPLIED

4.1 [] will loan to [] the following within fifteen (15) days after date of contract:

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(a) government loaned drawings for some of the antennas and crystal holders.

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-6-

- (b) government loaned model of modified discone antenna.
- (c) government loaned model of resonant dipole antenna.
- (d) government loaned "S" band antenna horn.
- (e) government loaned "L" band antenna horn.

- 4.2 [] will furnish sufficient information to enable [] to design and construct a retractable mounting structure (mast or pedestal). This information shall include the following data for the antenna system and housing: 25X1
- (a) Over-all dimensions.
 - (b) Estimated weight and location of mass-centers.
 - (c) Dimensions, exact location and method of intended mounting.
- This information shall be forwarded to [] as soon as available and shall be complete not later than two (2) months from date of contract. 25X1

5. GENERAL REQUIREMENTS

In general, the characteristics of the equipment to be supplied by [] shall be such as to fulfill the functional requirements and installation requirement specified in references (a), (b), (c), and (d) of 1.1, and more particularly, this WORK SCHEDULE. 25X1

- 5.1 [] design philosophy shall emphasize the following: 25X1
- 5.1.1 [] 25X1
- 5.1.2 Size, weight and wind drag of the equipment shall be reduced wherever possible.
- 5.1.3 Reliability of operation and ease of maintenance are essential.
- 5.2 Compatibility. Since this equipment is to operate with other [] made components, both parties shall so direct their efforts as to achieve a unity of design. This unity 25X1

-6-

-7-

shall be evident in general configurations, appearance (disguise of purpose), servicing facilities, exterior and interior finishes, and, wherever possible, in choice of components.

5.3 Mechanical design of the equipment shall be in accordance with all provisions of Specification MIL-E-16, 400 (for Class 2 temperature range).

5.3.1 The entire antenna system and housing shall be suitable for mounting on a retractable structure (mast or pedestal) of [] design. 25X1

5.3.2 The entire structure shall be designed to minimize wind stress.

5.3.3 [] 25X1

5.3.4 Protection from weather is required for exposed installation.

5.3.5 Type of connectors to be used shall be agreed upon with [] 25X1

5.3.6 All equipment shall be capable of withstanding vibration and shock tests as set forth in MIL-T-17113 and MIL-T-5422C unless specifically excepted.

Vibration and shock tests will be performed by [] with [] observance. 25X1
25X1

6. OBJECTIVES

6.1 ANTENNAS

The antenna system shall contain antennas for the following nine (9) frequency bands:

<u>Band</u>	<u>Frequency Range</u>
(a) 1	50 - 110 megacycles
(b) 2	110 - 250 megacycles
(c) 3	250 - 500 megacycles
(d) 4	500 - 1,000 megacycles
(e) 5	1,000 - 2,200 megacycles
(f) 6	2,200 - 4,500 megacycles

-7-

-8-

(cont'd)	<u>Band</u>	<u>Frequency Range</u>
(g)	7	4,500 - 10,000 megacycles
(h)	8	10,000 - 20,000 megacycles
(i)	9	20,000 - 40,000 megacycles

Four (4) antennas will be required for each band. Bands 1 and 2 will use the same antenna and will be separated by the use of filters. Each antenna shall meet the following requirements:

- (a) Half power beam width between 80° and 105° .
- (b) Low VSWR (3:1 or less).
- (c) Axial ratio (power) between 3:1 and 1:1 for circularly polarized antennas.

The design goal shall be to achieve at least 45 dbm tangential sensitivity in each band.

6.1.1 BANDS 1 AND 2 (50 - 250 mc.)

Every effort shall be made to develop one antenna to cover the full frequency range for Bands 1 and 2, thereby reducing the packaging problem. This antenna shall be circularly polarized or with forty-five degree (45°) orientation. A single antenna shall be used for Bands 1 and 2. Filters shall be supplied to separate the bands. Five (5) alternative antenna designs will be investigated.

- (a) Resonant dipole in front of absorbing plate or reflecting screen.
- (b) Modified disccone in front of absorbing plate or reflecting screen.
- (c) Quarter section disccones backed by absorbing plates.
- (d) Resonant bow-tie in front of reflecting screen or absorbing plate.
- (e) Spiral antenna.

A scale model of the modified disccone type antenna will be loaned to by the government through will 225X1

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-9-

evaluate this model and, if the results are acceptable for this equipment, will build full scale models and test them. If the government loaned scale model does not provide a usable design, investigations of the remaining alternatives listed above will be undertaken to select an acceptable one.

6.1.2 BAND 3 (250 - 500 mc.)

An antenna using a conical helix design previously developed by [] will be tried for this band. Such an antenna is expected to meet the following requirements: 25X1

- (a) Low scale lobe levels.
- (b) Circular polarization with an axial ratio (power) between 3:1 and 1:1.
- (c) VSWR of 3:1 or less over the band.
- (d) Rugged construction (enhanced by conical shape).
- (e) No external matching transformers needed.
- (f) Maximum package diameter of four (4) feet.
- (g) Half power beam width of 90° constant over entire band.

Because of possible difficulty in meeting the requirement for 90° beam width with the over-all package diameter limited to four feet, [] will investigate the possibility of stacking the antennas vertically to determine whether this can be done without creating undesirable interaction between antennas. 25X1

The feasibility of employing one of the following types of antennas will be investigated if the conical helix design proves to be unsatisfactory.

- (a) A small linearly polarized antenna based upon the results derived from development of an antenna for Bands 1 and 2.
- (b) A linear slot antenna.

Polarization for above types of antennas shall be forty-five degree (45°) orientation.

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6.1.3 BAND 4 (500 - 1,000 mc.)

The conical helix design will be used for this band if half power 90° beam width is achieved. In the event that its beam cannot be sufficiently broadened, a linear horn design will be tried as an alternative. This horn would be in the form of a large waveguide to coaxial adapter with a broadband type probe in the waveguide.

6.1.4 BAND 5 (1,000 - 2,200 mc.)

Either the helix or the horn type of antenna will be used for this band, depending upon which one shows the most favorable characteristics after comparative tests are made.

6.1.5 BANDS 6 - 9 (2,200 - 40,000 mc.)

For these four bands, [] will fabricate finished linearly polarized horns in accordance with government loaned drawings to be provided by Philco. 25X1

6.2 CRYSTALS AND CRYSTAL HOLDERS

[] will develop crystal holders to provide optimum sensitivity (at least 45 dbm) for each band of frequencies. Crystal shutters will be provided in the system. 25X1

6.2.1 BANDS 1, 2 and 3

[] will develop a crystal holder to use a crystal necessary to meet the sensitivity specification. A 1N21B or 1N263 will be tried here. 25X1

6.2.2 BANDS 4 and 5

Crystal holder UG119/U and adapter with 1N21B crystal to be tried here. If a 1N263 crystal can be used more advantageously, a crystal holder will be developed and constructed for these bands.

6.2.3 BANDS 6, 7, 8 and 9

Crystal holders are to be built into antenna horns in accordance with government loaned drawings. Crystal types will

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be selected which meet the 45 dbm tangential sensitivity specification.

6.3 ANTENNA HOUSING

The antenna system housing structure shall be suitable for mounting on a retractable structure (mast or pedestal).

6.3.1 ANTENNA ENCLOSURE

The antenna system shall be enclosed in a non-metallic housing of fibreglass bonded by a suitable resin. The preferred configuration for the housing is a series of three stacked conical frustums (the top section may be hemispherical). An alternate design may consist of a series of three stacked cylinders of decreasing diameters (the top section may be hemispherical). The sections shall be individually accessible for servicing.

6.3.2 SIZE AND WEIGHT

- (a) Maximum height of antenna housing structure: $12\frac{1}{2}$ feet.
- (b) Maximum base diameter of housing structure: 12 feet.
- (c) Weight of combined antenna system and housing shall be kept to a minimum.

6.4 PERFORMANCE TESTS

AEL shall perform the necessary tests on its equipments to insure compliance with the performance specifications as agreed upon herein. Some environmental testing may be necessary where proof of design requires it. The major systems and environmental testing will be done by However, 25X1 AEL shall participate by liaison and aid in rectification of any discrepancies which prevent the antenna system and housing from passing the environmental or performance specifications.

7. DELIVERIES

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25X1

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be packed for domestic shipment in accordance with standard commercial practice.

- 7.1 Dates for delivery of Item 1, consisting of three (3) models of antenna system with crystal holders and crystals plus housing, shall be as follows:
- (a) First model - five (5) months from date of contract.
 - (b) Second model - six (6) months from date of contract.
 - (c) Third model - six (6) months from date of contract.
- 7.2 Delivery of Item 2, consisting of material for Instruction and Operation guide, shall be due within two (2) months after acceptance of first model.
- 7.3 Delivery of Item 3, consisting of design drawing prints and reproducible drawings shall be as follows:
- (a) A print of each design drawing shall be delivered as they are prepared.
 - (b) The set of reproducible drawings shall be delivered within one (1) month after acceptance of the first model.
- 7.4 Delivery of Item 4, consisting of a complete assembly breakdown parts list, shall accompany the reproducible drawings, one month after acceptance of first model.
- 7.5 The monthly letter progress report required under Item 5 shall be due by the first day of each calendar month.
- 7.6 Performance tests for each model, Item 6, shall be completed prior to delivery of each model according to the schedule for Item 1 above.
- 7.7 Delivery of Item 7, the performance test report for each system, shall be due concurrently with delivery of each model of Item 1.

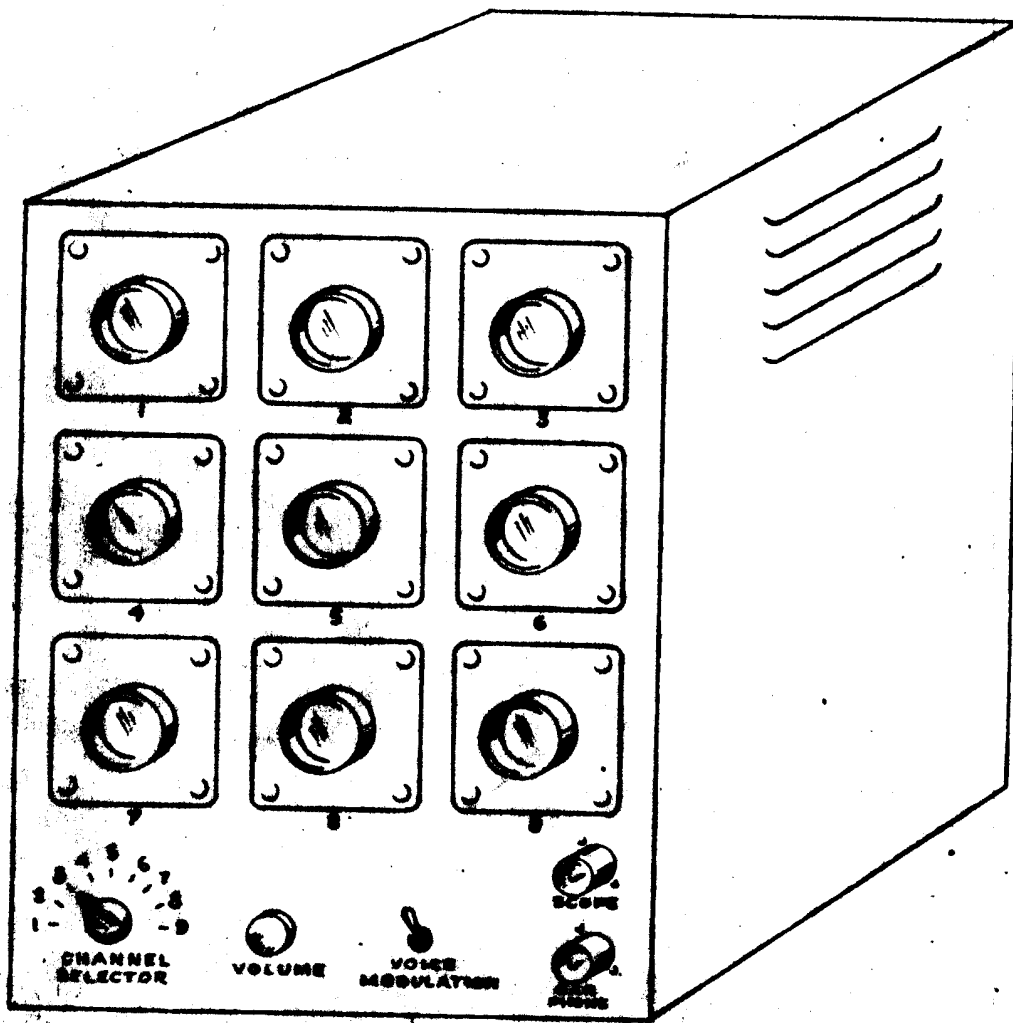
-12-

-13-

- 7.8 Delivery of Item 8, consisting of "breadboards" and other excess material, shall be due within one month after completion of Item 1.

Date: 24 August 1955

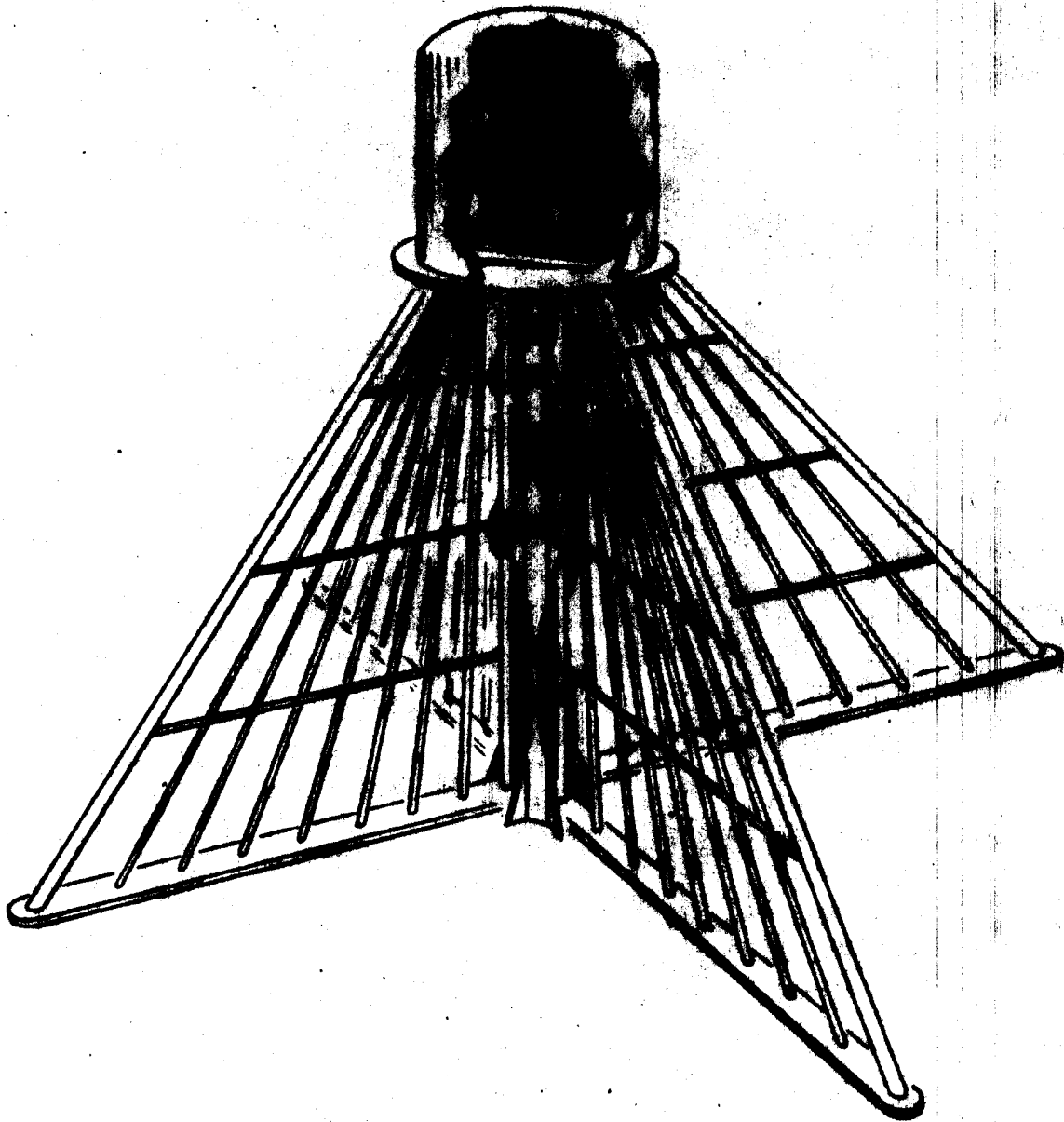
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PROPOSED LAYOUT OF
CONTROL UNIT

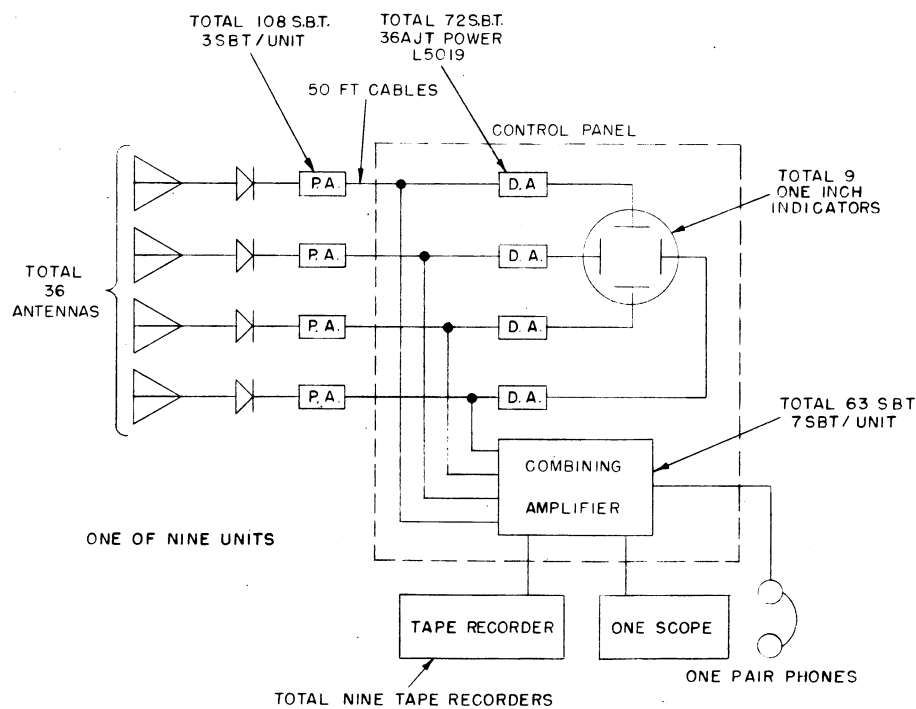
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ARTIST'S CONCEPTION OF
SUGGESTED ANTENNA UNIT

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TRANSISTORS ARE USED IN PRINTED CIRCUIT AMPLIFIERS

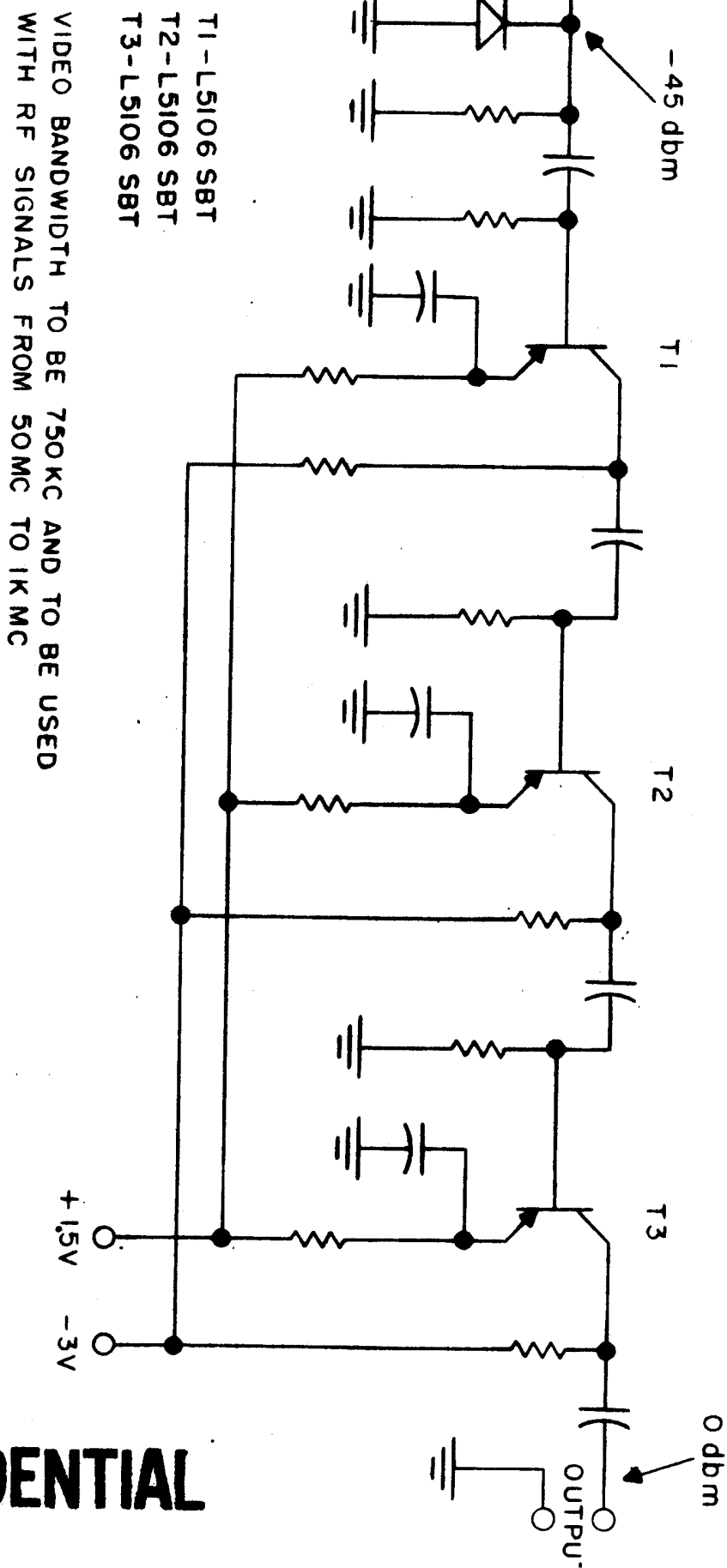
WITH FOUR ANTENNAS PER FREQUENCY SPECTRUM, THE FREQUENCIES TO BE COVERED WILL BE AS FOLLOWS:

- 1 - 50 - 250 MC
- 2 - 250 - 500 MC
- 3 - 500 - 1,000 MC
- 4 - 1,000 - 2,200 MC
- 5 - 2,200 - 4,500 MC
- 6 - 4,500 - 10,000 MC
- 7 - 10,000 - 18,000 MC
- 8 - 18,000 - 26,000 MC
- 9 - 26,000 - 40,000 MC

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BLOCK DIAGRAM OF
PASSIVE RECEIVER INTERCEPT SYSTEM

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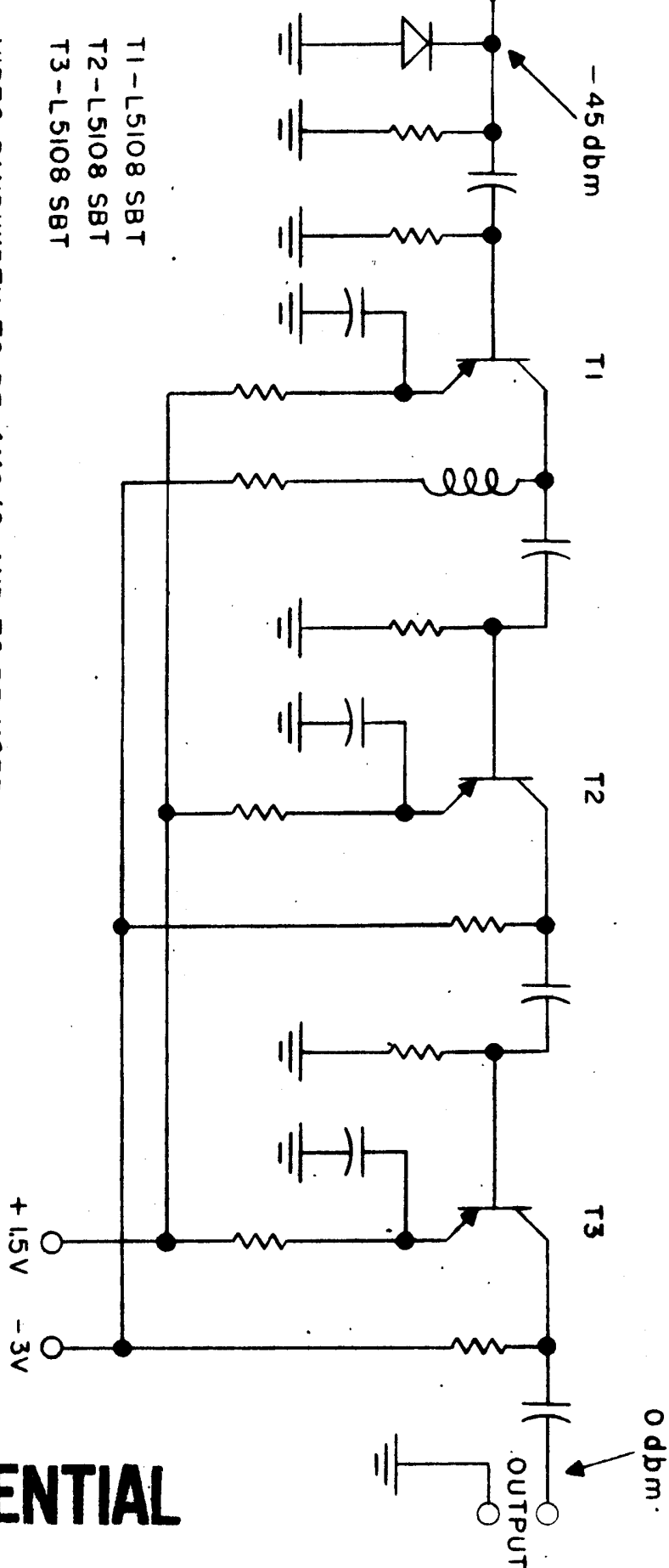


ANTENNA AND TRANSISTORIZED
PREAMPLIFIER

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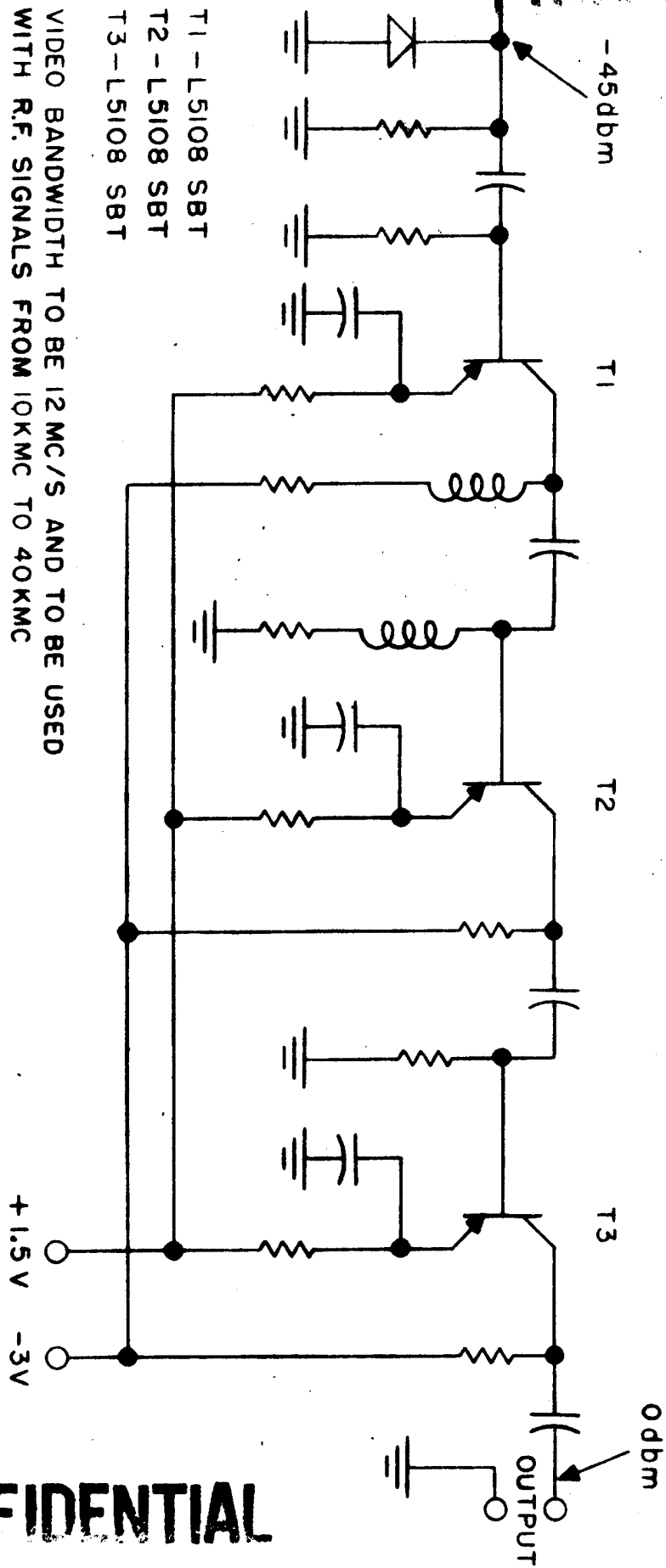
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T1-L5108 SBT
 T2-L5108 SBT
 T3-L5108 SBT
 VIDEO BANDWIDTH TO BE 4MC/S AND TO BE USED
 WITH RF SIGNALS FROM 1KMC TO 10K MC

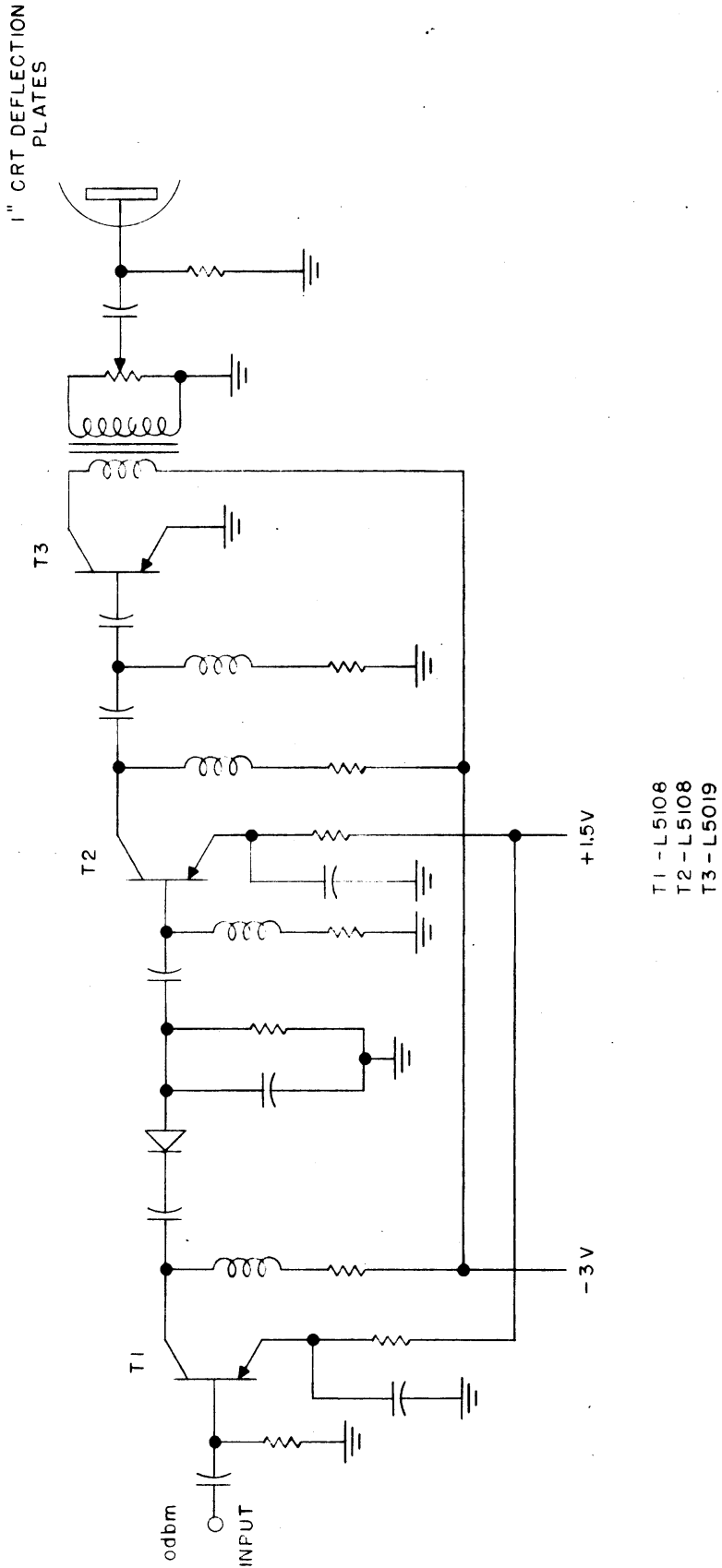


ANTENNA AND TRANSISTORIZED
 PREAMPLIFIER

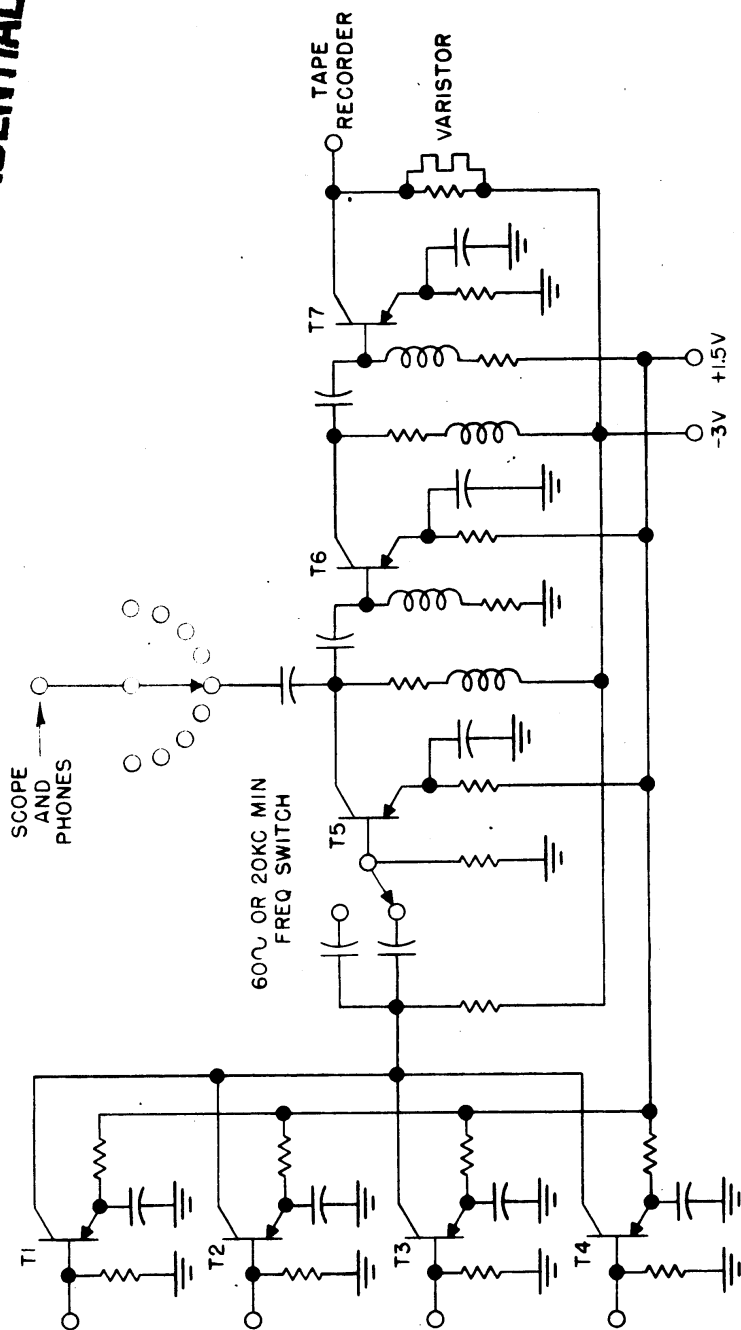
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CONFIDENTIALANTENNA AND TRANSISTORIZED
PREAMPLIFIER**CONFIDENTIAL**

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THE PEAKING VIDEO RESPONSE OF THIS AMPLIFIER IS THE SAME
AS THAT OF THE PREAMPLIFIER WITH WHICH IT IS USED.

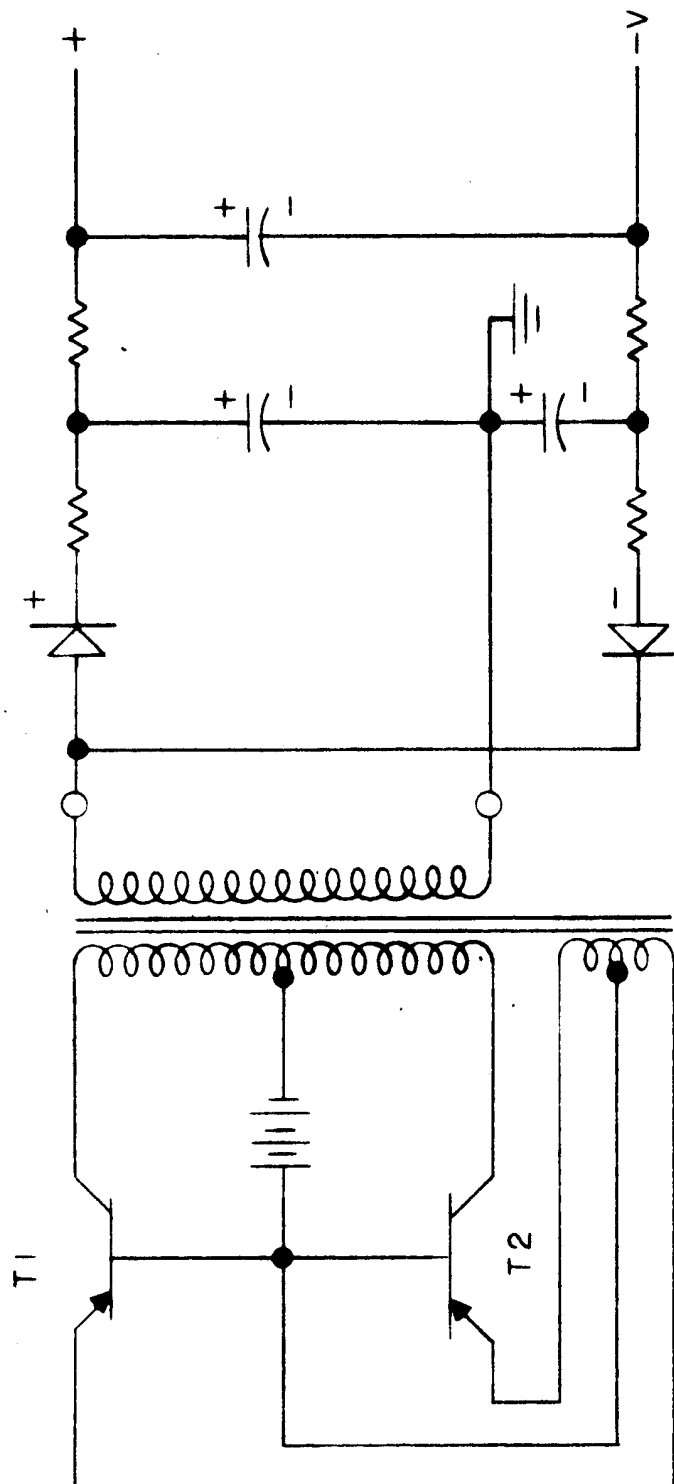
	VIDEO RANGE		
	12MC	4MC	75MC
T1 -	L5108	L5108	L5106
T2 -	L5108	L5108	L5106
T3 -	L5108	L5108	L5106
T4 -	L5108	L5108	L5106
T5 -	L5108	L5108	L5106
T6 -	L5108	L5108	L5106
T7 -	L5108	L5108	L5106

COMBINING AMPLIFIER

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**TRANSISTOR POWER SUPPLY
FOR C.R.T. H.V.**



T1 - HIGH POWER TRANSISTOR
T2 - HIGH POWER TRANSISTOR

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Prices for Spare Parts in
Antennas Related to TP-3700-2.7

3	Band 1	Discones	\$ 225.00
3	Band 2	Helices and Radomes	551.00
3	Band 3	Helices and Radomes	409.00
3	Band 4	Helices and Radomes	409.00
3	Band 5	Helices and Radomes	409.00
3	Band 6	Horns with Windows	230.00
3	Band 7	Horns with Windows	264.00
3	Band 8	Horns with Windows	264.00
3	Band 9	Horns with Windows	264.00
		TOTAL PRICE	\$4191.00

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SUPPLEMENTARY PROPOSAL TO TP-5500-2.1**CONFIDENTIAL**Bandpass Filters

25X1

The use of bandpass filters would accurately limit the response of each band to only those frequencies specified for that band. This would eliminate the possibility that a signal would simultaneously be picked up in many different bands. The antenna and crystal holder combination will provide readable reception to frequencies far outside their specified bandwidth. This could conceivably cause operational difficulties. This proposal outlines a program for adding filters to the previous system of antennas and crystal holders.

- a. Band 1 Filter - Some design work is anticipated to produce a filter covering this band. It is anticipated that an insertion loss of better than 4 db can be obtained with an attenuation of greater than 40 db within 10% of the low and high frequency band limits. A lumped parameter filter is planned for this band.
- b. Band 2 - Some design work is anticipated for Band 2 filter. Insertion loss should be better than 4 db in the band and greater than 40 db within 10% of the high frequency and low frequency band limits. A hybrid type of filter using both lumped and distributed parameters is contemplated for this band.
- c. Band 3 - has built an unusual type of lumped-distributed^{25X1} filter covering a bandwidth very similar to this band. The use of this filter is contemplated. A minor amount of design work will be required.

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- d. Band 4 Filter - ☐ has a filter of the lumped-distributed 25X1 type that can meet the band requirements of Band 4 filter. Insertion loss will be better than 4 db and attenuation greater than 40 db within 10% of band limits.
- e. Bands 5 and 6 filters - It is planned to use corrugated ridge waveguide filters. ☐ has designed and built many 25X1 filters of this type. Some design time will be required to accurately set the band limits. Design goals will be better than 4 db insertion loss in the band and between 40 and 60 db attenuation within 10% of the band limits.
- f. Band 7 - Corrugated waveguide filters will be used with better than 4 db insertion loss in the band and between 40 and 60 db attenuation within 10% of band limits. Some design time will be required to accurately position the band limits of the filter.

Conclusion

No technical difficulties are anticipated in producing filters for this proposal. Some design time will be required to accurately position the lower passband and the upper passband of each filter and to determine the number of sections necessary to obtain the required attenuation outside the passband. If this part of the work is done concurrent with the antenna and crystal holder packaging, there should be no delay in delivering the completed system.

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Proposed Budget for
Supplementary Proposal to TP-5500-2.7

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This budget covers all added costs to provide bandpass filters for Bands 1 to 7 inclusive and packaging into the complete system.

5.6 weeks Senior Engineer		\$ 918.40
2 weeks Mechanical Engineer		270.00
4.6 weeks Development I Engineer		575.00
15 weeks Technician		1,260.00
28.8 weeks Machinist		2,592.00
2 weeks Drafting		176.00
		\$ 5,791.40
Overhead 95%		5,501.83
Materials		2,745.00
		\$14,038.23
Fixed Fee 7%		982.67
		\$15,020.90
TOTAL		

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